

What is Claimed is:

- 1 1. A multiple-input multiple-output first-in first-out buffer structure, comprising:
2 a command number generator generating a command order number for each
3 command entering said buffer structure;
4 a plurality of single-input single-output buffers each having a capacity of buffering
5 multiple commands and storing each incoming command with an associated
6 command order number; and
7 a command number comparator comparing the command order number of an
8 outgoing command at each single-input single-output buffer and determining which
9 command to output.
- 1 2. The multiple-input multiple-output first-in first-out buffer structure as claimed in
2 claim 1, wherein said command number generator has a cyclic counter for generating
3 a command order number that is incremented by 1 when a command enters said
4 buffer structure, and said command number comparator has a cyclic counter for
5 generating a comparison value that is incremented by 1 when a command leaves said
6 buffer structure.
- 1 3. The multiple-input multiple-output first-in first-out buffer structure as claimed in
2 claim 2, wherein the two cyclic counters have an identical capacity to generate
3 ordering numbers which is greater or equal to the maximum number of commands
4 that can be buffered in said buffer structure.
- 1 4. A command order maintenance scheme for a posted multiple-input and multiple-

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each subcommand of a same command is assigned with a same command order number and the last subcommand within a same command is tagged with an end of transaction indicator.

5. The multiple-input multiple-output first-in first-out buffer structure as claimed in claim 1, wherein an incoming command is divided into a plurality of subcommands, each subcommand of a same command is assigned with a different command order number.
6. A command order maintenance scheme for a posted multiple-input and multiple-output first-in first-out buffer structure and a non-posted multiple-input and multiple-output first-in first-out buffer structure, said command order maintenance scheme comprising:
a pending posted write counter for storing the total number of pending posted write commands within said posted buffer structure; and
a plurality of dependency counters each being associated with a command within said non-posted buffer structure, the value of the dependency counter of each said command being set to the value of said pending posted write counter when said command enters said non-posted buffer structure.
7. The command order maintenance scheme as claimed in claim 6, wherein said posted buffer structure further comprises a command number generator generating a command order number for each command entering said posted buffer structure, a plurality of single-input single-output buffers each having a capacity of buffering multiple commands and storing each incoming command with an associated command order number, and a command number comparator comparing the

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- command order number of an outgoing command at each single-input single-output buffer in said posted buffer structure and determining which command to output.
8. The command order maintenance scheme as claimed in claim 6, wherein said non-posted buffer structure further comprises a command number generator generating a command order number for each command entering said non-posted buffer structure, a plurality of single-input single-output buffers each having a capacity of buffering multiple commands and storing each incoming command with an associated command order number, and a command number comparator comparing the command order number of an outgoing command at each single-input single-output buffer in said non-posted buffer structure and determining which command to output.
 9. The command order maintenance scheme as claimed in claim 6, wherein said pending posted write counter is increased by 1 when a posted write command enters said posted buffer structure, and decreased by 1 when a posted write command exits said posted buffer structure.
 10. The command order maintenance scheme as claimed in claim 6, wherein the value of each dependency counter in said non-posted buffer structure is decreased by 1 if the value is greater than 0 when a posted write command exits said posted buffer structure.
 11. The command order maintenance scheme as claimed in claim 10, wherein a command in said non-posted buffer structure is ready to exit if the value of its associated dependency counter becomes 0.
 12. The command order maintenance scheme as claimed in claim 6, wherein a long

posted write command is divided into a plurality of basic write commands with its last basic write command being tagged with an end of transaction indicator, and said pending posted write counter is increased by 1 only when the last basic write command of a long posted write command enters said posted buffer structure and is decreased by 1 only when the last basic write command of a long posted write command exits said posted buffer structure.

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